

Virginia Need-to-Know Criteria for Wastewater Treatment Operators

Core Competencies for Wastewater Treatment Operators

Evaluate Incoming Wastestream/Sidestream Characteristics	Class 4	Class 3	Class 2	Class 1
Biological/Chemical	X	X	X	X
Color	X	X	X	X
Flow pattern	X	X	X	X
Mixing pattern	X	X	X	X
Odor	X	X	X	X
Solids concentration	X	X	X	X
Volume	X	X	X	X

Required Capabilities for Evaluate Incoming Wastestream/Sidestream Characteristics:

- Ability to communicate observations verbally and in writing
- Ability to discriminate between normal and abnormal conditions
- Knowledge of normal characteristics of wastewater

Monitor, Evaluate and Adjust Treatment Processes	Class 4	Class 3	Class 2	Class 1
Preliminary Treatment				
Screening	X	X	X	X
Comminution	X	X	X	X
Grit removal	X	X	X	X
Flow equalization	X	X	X	X
Primary Treatment				
Clarifiers	X	X	X	X
Odor control	X	X	X	X
Secondary Treatment				
Fixed-film reactors (trickling filters, RBCs)	X	X	X	X
Activated sludge	X	X	X	X
Stabilization ponds without aeration	X	X	X	X
Stabilization ponds with aeration	X	X	X	X
Advanced (Tertiary) Treatment				
Polishing ponds	X	X	X	X
Chemical/physical advanced waste treatment without secondary (carbon adsorption, air stripping, chemical coagulation, precipitation, etc.)		X	X	X
Chemical/physical advanced waste treatment following secondary (carbon adsorption, air stripping, chemical coagulation, precipitation, etc.)		X	X	X
Biological or chemical/biological advanced waste treatment (nitrification, denitrification, phosphorus removal, etc.)	X	X	X	X
Nitrification by designed extended aeration only		X	X	X
Ion exchange for advanced waste treatment		X	X	X
Reverse osmosis, electrodialysis and other membrane filtration		X	X	X
Media filtration		X	X	X

(continued)

Core Competencies (continued)

Monitor, Evaluate and Adjust Treatment Processes <i>(continued)</i>	Class 4	Class 3	Class 2	Class 1
Chemical Addition				
Add dry chemicals	X	X	X	X
Add gaseous chemicals		X	X	X
Add liquid chemicals	X	X	X	X
Disinfection				
Dechlorination	X	X	X	X
Gas chlorination		X	X	X
Hypochlorination	X	X	X	X
Ultraviolet irradiation	X	X	X	X
Effluent discharge and reuse	X	X	X	X
Solids Handling				
Conditioning (chemical, thermal, elutriation)	X	X	X	X
Dewatering (filtration, centrifugation, drying beds)	X	X	X	X
Stabilization (digestion, thermal, chemical)	X	X	X	X
Thickening (gravity, flotation, centrifugation, filtration)		X	X	X
Volume reduction (drying, incineration, composting)	X	X	X	X

Required Capabilities for Monitor, Evaluate, and Adjust Treatment Processes:

- Ability to adjust chemical feed rates, flow patterns, and process units
- Ability to calculate dosage rates
- Ability to confirm chemical strength
- Ability to evaluate, diagnose, and troubleshoot process units
- Ability to interpret Material Safety Data Sheets
- Ability to maintain processes in normal operating conditions
- Ability to measure and prepare chemicals
- Ability to perform basic math and process control calculations
- Knowledge of biological science
- Knowledge of flow measurement principles
- Knowledge of general chemistry
- Knowledge of general electrical and mechanical principles
- Knowledge of normal chemical range
- Knowledge of personal protective equipment
- Knowledge of physical science
- Knowledge of principles of measurement
- Knowledge of proper application, handling, and storage of chemicals
- Knowledge of regulations and policies
- Knowledge of sludge management practices
- Knowledge of wastewater treatment concepts and treatment processes

Core Competencies (continued)

Evaluate and Maintain Equipment	Class 4	Class 3	Class 2	Class 1
Evaluate Equipment				
Check and evaluate capacity of equipment	X	X	X	X
Inspect equipment for abnormal conditions	X	X	X	X
Measure and evaluate head loss	X	X	X	X
Read and evaluate chart and meter results	X	X	X	X
Read and evaluate gauges	X	X	X	X
Perform Maintenance				
Backflow prevention devices	X	X	X	X
Blowers and compressors	X	X	X	X
Boilers		X	X	X
Chemical feeders	X	X	X	X
Drives	X	X	X	X
Engines (gas, diesel)	X	X	X	X
Fittings/Piping	X	X	X	X
Generators	X	X	X	X
HVAC equipment			X	X
Hydraulic equipment			X	X
Instrumentation	X	X	X	X
Motors	X	X	X	X
Pneumatic equipment			X	X
Pumps	X	X	X	X
Tanks and infrastructure	X	X	X	X
Traps and drains	X	X	X	X
Valves	X	X	X	X

Required Capabilities for Evaluate and Maintain Equipment:

- Ability to assign work to proper trade
- Ability to calibrate equipment
- Ability to diagnose and troubleshoot equipment
- Ability to differentiate between preventive and corrective maintenance
- Ability to discriminate between normal and abnormal conditions
- Ability to monitor and adjust equipment
- Ability to order necessary spare parts
- Ability to perform basic math
- Ability to perform general maintenance
- Ability to read and interpret O&M manuals
- Knowledge of facility operation and maintenance
- Knowledge of general electrical and mechanical principles
- Knowledge of hydraulic and pneumatic principles
- Knowledge of internal combustion engines
- Knowledge of lubricant and fluid characteristics
- Knowledge of process control instrumentation
- Knowledge of safety regulations
- Knowledge of start-up and shut-down procedures

Core Competencies (continued)

Operate Equipment	Class 4	Class 3	Class 2	Class 1
Backflow prevention devices	X	X	X	X
Blowers and compressors	X	X	X	X
Boilers		X	X	X
Chemical feeders	X	X	X	X
Computers	X	X	X	X
Drives	X	X	X	X
Electronic testing equipment	X	X	X	X
Engines	X	X	X	X
Flow meters	X	X	X	X
Generators	X	X	X	X
Hand and power tools	X	X	X	X
Heat exchangers		X	X	X
Heavy vehicles		X	X	X
HVAC equipment			X	X
Hydrants		X	X	X
Hydraulic equipment			X	X
Instrumentation	X	X	X	X
Lifting equipment		X	X	X
Motors	X	X	X	X
Odor control equipment	X	X	X	X
Pneumatic equipment	X	X	X	X
Pumps	X	X	X	X
Tanks and infrastructure	X	X	X	X
Traps and drains	X	X	X	X
Valves	X	X	X	X

Required Capabilities for Operate Equipment:

- Ability to monitor, evaluate and adjust equipment
- Ability to read and interpret O&M manuals
- Knowledge of function of tools
- Knowledge of general electrical and mechanical principles
- Knowledge of hydraulic and pneumatic principles
- Knowledge of regulations
- Knowledge of safety procedures
- Knowledge of start-up and shut-down procedures
- Knowledge of wastewater treatment concepts

Core Competencies (continued)

COLLECT SAMPLES AND INTERPRET LABORATORY ANALYSES	Class 4	Class 3	Class 2	Class 1
Bioassay			X	X
Biochemical oxygen demand	X	X	X	X
Carbon dioxide			X	X
Chemical oxygen demand			X	X
Chlorine residual	X	X	X	X
Coliform	X	X	X	X
Dissolved oxygen	X	X	X	X
Dissolved solids	X	X	X	X
Metal analysis	X	X	X	X
Microbiological	X	X	X	X
Nitrogen (Ammonia, Nitrate, Nitrite, Total Kjeldahl)	X	X	X	X
pH	X	X	X	X
Phosphorus	X	X	X	X
Settleability testing	X	X	X	X
Solids	X	X	X	X
Temperature	X	X	X	X
Volatile acids		X	X	X

Required Capabilities for Collect Samples and Interpret Laboratory Analyses:

- Ability to calibrate instruments
- Ability to follow written procedures
- Ability to interpret Material Safety Data Sheets
- Ability to perform laboratory calculations
- Ability to recognize abnormal analytical results
- Knowledge of approved analytical procedures
- Knowledge of biological science
- Knowledge of chain of custody
- Knowledge of general chemistry
- Knowledge of laboratory equipment and procedures
- Knowledge of normal characteristics of wastewater
- Knowledge of physical science
- Knowledge of principles of measurement
- Knowledge of proper chemical handling and storage
- Knowledge of quality control and assurance practices
- Knowledge of safety regulations
- Knowledge of sampling and preservation procedures

Core Competencies (continued)

PERFORM LABORATORY ANALYSES	Class 4	Class 3	Class 2	Class 1
Ammonia/Total Kjeldahl		X	X	X
Bioassay			X	X
Biochemical oxygen demand	X	X	X	X
Carbon dioxide			X	X
Chemical oxygen demand	X	X	X	X
Chlorine residual	X	X	X	X
Coliform	X	X	X	X
Dissolved oxygen	X	X	X	X
Dissolved solids	X	X	X	X
Microbiological		X	X	X
Nitrate/Nitrite			X	X
Oxygen uptake/Respiration rate			X	X
pH	X	X	X	X
Phosphorus		X	X	X
Settleability testing	X	X	X	X
Solids	X	X	X	X
Temperature	X	X	X	X
Volatile acids		X	X	X

Required Capabilities for Perform Laboratory Analyses:

- Ability to calibrate instruments
- Ability to follow written procedures
- Ability to interpret Material Safety Data Sheets
- Ability to perform laboratory calculations
- Ability to recognize abnormal analytical results
- Knowledge of approved analytical procedures
- Knowledge of biological science
- Knowledge of chain of custody
- Knowledge of general chemistry
- Knowledge of laboratory equipment and procedures
- Knowledge of normal characteristics of wastewater
- Knowledge of physical science
- Knowledge of principles of measurement
- Knowledge of proper chemical handling and storage
- Knowledge of quality control and assurance practices
- Knowledge of safety regulations
- Knowledge of sampling and preservation procedures

Core Competencies (continued)

Perform Security, Safety and Administrative Procedures	Class 4	Class 3	Class 2	Class 1
Perform Security and Safety Procedures				
Bloodborne pathogens	X	X	X	X
Chemical handling	X	X	X	X
Confined space entry	X	X	X	X
Electrical hazards	X	X	X	X
Facility upset	X	X	X	X
Fire safety	X	X	X	X
Lock-out/tag-out	X	X	X	X
Natural and manmade disasters	X	X	X	X
Personal protective equipment	X	X	X	X
Respiratory protection	X	X	X	X
Spill response		X	X	X
Transportation	X	X	X	X
Terrorism	X	X	X	X
Perform Administrative Procedures				
Administer compliance, emergency preparedness and safety program		X	X	X
Develop operation and maintenance plan		X	X	X
Plan and organize work activities		X	X	X
Record and evaluate data	X	X	X	X
Respond to complaints	X	X	X	X
Write regulatory authority reports	X	X	X	X

Required Capabilities for Perform Security, Safety and Administrative Procedures:

- Ability to assess likelihood of disaster occurring
- Ability to communicate safety hazards verbally and in writing
- Ability to conduct meetings and training programs
- Ability to coordinate emergency response with other organizations
- Ability to evaluate facility performance
- Ability to evaluate proposals
- Ability to interpret and transcribe data
- Ability to perform basic math
- Ability to perform impact assessment of change
- Ability to recognize unsafe work conditions
- Ability to review reports
- Ability to select and operate safety equipment
- Ability to translate technical language into common terminology
- Ability to write plans, policies and procedures
- Ability to write reports
- Knowledge of emergency plans
- Knowledge of facility operation and maintenance
- Knowledge of local codes and ordinances
- Knowledge of monitoring and reporting requirements
- Knowledge of potential causes and impact of disasters on facility
- Knowledge of principles of management
- Knowledge of principles of public relations
- Knowledge of recordkeeping functions & policies
- Knowledge of regulations